

1 What is claimed is:

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3 1. A data processing system, comprising:

4 a plurality of hosts;

5 a plurality of data storage devices; and

6 an apparatus coupling the hosts to the data storage devices, the apparatus having

7 host ports connected to the hosts, wherein the data storage devices are configured into

8 logical storage units, the apparatus is programmed with a mapping of the hosts to

9 respective logical storage units, and the apparatus is programmed to permit data access

10 of a logical storage unit by the host to occur through a host port upon receipt at the host

11 port of a request from the host for access to the logical storage unit when the request

12 from the host for access to the logical storage unit is in conformance with the mapping,

13 and the apparatus is programmed to deny data access by the host through the host port

14 upon receipt at the host port of a request from the host for data access that is not in

15 conformance with the mapping.

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17 2. The data processing system as claimed in claim 1, wherein the apparatus is

18 programmed to respond to receipt at the host port of the request from the host for access

19 to the logical storage unit by decoding a host identifier and a logical storage unit

20 specification from the request for access to the logical storage unit, and determining

21 whether or not the host identifier and the logical storage unit specification decoded

22 from the request for access to the logical storage unit are in conformance with the

23 mapping, and upon determining that the host identifier and the logical storage unit

24 specification decoded from the request for access to the logical storage unit are in

1 conformance with the mapping, permitting data access of the logical storage unit to
2 occur at the host port.

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4 3. The data processing system as claimed in claim 1, wherein the mapping
5 prohibits each host from accessing all of the logical storage units.

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7 4. The data processing system as claimed in claim 1, wherein the mapping includes
8 a respective mapping for each host of logical unit numbers of storage to data storage
9 volumes configured from the data storage devices.

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11 5. The data processing system as claimed in claim 4, wherein the mapping restricts
12 the data storage volumes that are visible to said each host.

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14 6. The data storage system as claimed in claim 4, wherein the apparatus is
15 programmed to report to said each host the logical unit numbers of storage accessible to
16 said each host.

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18 7. The data processing system as claimed in claim 1, wherein the apparatus
19 includes a graphical user interface for permitting a user to program the mapping of the
20 hosts to the respective logical storage units.

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22 8. The data processing system as claimed in claim 1, wherein the apparatus
23 includes a switch for routing the data storage access requests from the host ports to
24 ports that provide access to the data storage.

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2 9. The data processing system as claimed in claim 8, wherein the apparatus is
3 programmed with a mapping of the hosts to the ports that provide access to the data
4 storage.

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6 10. The data processing system as claimed in claim 9, wherein the apparatus is
7 programmed with a mapping of logical volumes of storage that are accessible from each
8 of the ports that provide access to the data storage.

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10 11. The data processing system as claimed in claim 8, wherein one or more of the
11 ports that provide access to the data storage are assigned to each host, a set of storage
12 volumes are made accessible from each of the ports that provide access to the data
13 storage, and the apparatus is programmed so that said each host can access storage at
14 said each of the ports that provide access to the data storage only if said each of the
15 ports that provide access to the data storage has been assigned to said each host.

16

17 12. The data processing system as claimed in claim 8, wherein the mapping includes
18 a respective mapping for each host of logical unit numbers of storage to data storage
19 volumes that are configured from the data storage devices and are accessible to said
20 each host, and the apparatus is programmed to respond to a request directed to said each
21 of the ports from said each host for a report of the logical unit numbers of storage that
22 are accessible to said each host from said each of the ports that provide access to the
23 data storage by providing a report of the logical unit numbers of storage that are

1 accessible to said each host from said each of the ports that provide access to the data
2 storage.

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4 13. The data processing system as claimed in claim 8, wherein the apparatus is
5 programmed to provide different storage access characteristics for the ports that provide
6 access to the data storage.

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8 14. The data processing system as claimed in claim 8, wherein the apparatus is
9 programmed with a respective private/shared flag for each port that provides access to
10 the data storage for indicating whether or not said each port that provides access to the
11 data storage provides access to data storage that is private to a respective one of the
12 hosts.

13

14 15. The data processing system as claimed in claim 8, wherein the apparatus
15 includes a graphical user interface for permitting a user to program the mapping of the
16 hosts to the respective logical storage units, and the graphical user interface indicates
17 which of the ports that provide access to the data storage are accessible to each host.

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19 16. The data processing system as claimed in claim 1, wherein the data storage
20 devices include disk drives in a cached disk storage subsystem.

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22 17. The data processing system as claimed in claim 1, wherein the apparatus
23 includes at least one fibre-channel switch providing the host ports, and wherein the
24 hosts are connected to the fibre-channel switch by a fibre-channel data network.

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2 18. The data processing system as claimed in claim 1, wherein the apparatus
3 includes a first switch coupling the hosts to the data storage devices and a second
4 switch coupling the hosts to the data storage devices, wherein each switch has a host
5 port coupled to each host.

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7 19. The data processing system as claimed in claim 18, wherein the apparatus
8 includes a controller for each switch, wherein each controller is programmed with the
9 mapping of the hosts to the respective logical storage units.

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11 20. An apparatus for coupling a plurality of hosts to a plurality of data processing
12 devices, the apparatus comprising a switch having host ports for connection to the hosts
13 and ports for providing access to the data storage devices, and a controller programmed
14 with a mapping of the hosts to respective logical storage units configured from the data
15 storage devices, wherein the controller is programmed for controlling the switch to
16 respond to data storage access requests received at the host ports from the hosts for
17 access to the logical storage units by decoding a host identifier and a logical storage
18 unit specification from each data access request received at each host port, and
19 determining whether or not the host identifier and the logical storage unit specification
20 decoded from said each data access request are in conformance with the mapping, in
21 order to permit data access of the logical storage unit to occur through said each host
22 port when the host identifier and the logical storage unit specification decoded from
23 said each data access request are in conformance with the mapping, and to deny access
24 of the logical storage unit by said each host from occurring through said each host port

1 when the host identifier and the logical storage unit specification decoded from said
2 each data access request are in not conformance with the mapping.

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4 21. The apparatus as claimed in claim 20, wherein the mapping prohibits each host
5 from accessing all of the logical storage units.

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7 22. The apparatus as claimed in claim 20, wherein the mapping includes a
8 respective mapping for each host of logical unit numbers of storage to data storage
9 volumes configured from the data storage devices.

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11 23. The apparatus as claimed in claim 22, wherein the mapping restricts the data
12 storage volumes that are visible to said each host.

13

14 24. The apparatus as claimed in claim 22, wherein the apparatus is programmed to
15 report to said each host the logical unit numbers of storage accessible to said each host.

16

17 25. The apparatus as claimed in claim 20, wherein the apparatus is programmed
18 with a mapping of the hosts to the ports that provide access to the data storage, and a
19 mapping of logical volumes of storage that are accessible from each of the ports that
20 provide access to the data storage.

21

22 26. The apparatus as claimed in claim 20, wherein one or more of the ports that
23 provide access to the data storage are assigned to each host, a set of storage volumes are
24 made accessible from each of the ports that provide access to the data storage, and the

1 apparatus is programmed so that said each host can access storage at said each of the
2 ports that provide access to the data storage only if said each of the ports that provide
3 access to the data storage has been assigned to said each host.

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5 27. The apparatus as claimed in claim 20, wherein the mapping includes a
6 respective mapping for each host of logical unit numbers of storage to data storage
7 volumes that are configured from the data storage devices and are accessible to said
8 each host, and the apparatus is programmed to respond to a request directed to said each
9 of the ports from said each host for a report of the logical unit numbers of storage that
10 are accessible to said each host from said each of the ports that provide access to the
11 data storage by providing a report of the logical unit numbers of storage that are
12 accessible to said each host from said each of the ports that provide access to the data
13 storage.

14

15 28. The apparatus as claimed in claim 20, wherein the apparatus is programmed to
16 provide different storage access characteristics for the ports that provide access to the
17 data storage.

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19 29. The apparatus as claimed in claim 20, wherein the apparatus is programmed
20 with a respective private/shared flag for each port that provides access to the data
21 storage for indicating whether or not said each port that provides access to the data
22 storage provides access to data storage that is private to a respective one of the hosts.

23

1 30. The apparatus as claimed in claim 20, wherein the apparatus includes a
2 graphical user interface for permitting a user to program the mapping of the hosts to the
3 respective logical storage units, and the graphical user interface indicates which of the
4 ports that provide access to the data storage are accessible to each host.

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6 31. The apparatus as claimed in claim 20, wherein the data storage devices include
7 disk drives in a cached disk storage subsystem.

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9 32. The apparatus as claimed in claim 20, wherein the switch is a fibre-channel
10 switch, and wherein the hosts are connected to the fibre-channel switch by a fibre-
11 channel data network."

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13 33. In a data processing system including multiple hosts and multiple data storage
14 devices, a method of operation of an apparatus for coupling the hosts to the data storage
15 devices, the apparatus having host ports connected to the hosts, the data storage devices
16 being configured into logical storage units, wherein the method includes:

17 programming the apparatus with a mapping of the hosts to the logical storage
18 units; and

19 the apparatus responding to data storage access requests received at a host port
20 from a host by permitting data access of a logical storage unit by the host to occur
21 through a host port upon receipt at the host port of a request from the host for access to
22 the logical storage unit when the request from the host for access to the logical storage
23 unit is in conformance with the mapping, and denying data access by the host through

1 the host port upon receipt at the host port of a request from the host for data access that
2 is not in conformance with the mapping.

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4 34. The method as claimed in claim 33, which includes the apparatus responding to
5 receipt at the host port of the request from the host for access to the logical storage unit
6 by decoding a host identifier and a logical storage unit specification from the request for
7 access to the logical storage unit, and determining whether or not the host identifier and
8 the logical storage unit specification decoded from the request for access to the logical
9 storage unit are in conformance with the mapping, and upon determining that the host
10 identifier and the logical storage unit specification decoded from the request for access
11 to the logical storage unit are in conformance with the mapping, permitting data access
12 of the logical storage unit to occur at the host port.

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14 35. The method as claimed in claim 33, wherein the mapping prohibits each host
15 from accessing all of the logical storage units.

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17 36. The method as claimed in claim 33, which includes programming the apparatus
18 with a respective mapping for each host of logical unit numbers of storage to data
19 storage volumes configured from the data storage devices.

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21 37. The method as claimed in claim 36, wherein the mapping restricts the data
22 storage volumes that are visible to said each host.

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1 38. The method as claimed in claim 36, which includes the apparatus reporting to
2 said each host the logical unit numbers of storage accessible to said each host.

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4 39. The method as claimed in claim 33, wherein the apparatus includes a graphical
5 user interface for permitting a user to program the mapping of the hosts to the
6 respective logical storage units.

7

8 40. The method as claimed in claim 33, which includes the apparatus routing the
9 data storage access requests from the host ports to ports that provide access to the data
10 storage.

11

12 41. The method as claimed in claim 40, which includes programming the apparatus
13 with a mapping of the hosts to the ports that provide access to the data storage.

14

15 42. The method as claimed in claim 41, which includes programming the apparatus
16 with a mapping of logical volumes of storage that are accessible from each of the ports
17 that provide access to the data storage.

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19 43. The method as claimed in claim 40, which includes assigning to each host one
20 or more of the ports that provide access to the data storage, and mapping a set of
21 storage volumes to each port that provides access to the data storage, so that said each
22 host can access storage at said each port that provides access to the data storage only if
23 said each port that provides access to the data storage has been assigned to said each
24 host.

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2 44. The method as claimed in claim 40, wherein the mapping includes a respective
3 mapping for each host of logical unit numbers of storage to data storage volumes that
4 are configured from the data storage devices and are accessible to said each host, and
5 which includes the apparatus responding to a request from said each host for a report of
6 the logical unit numbers of storage that are accessible to said each host from said each
7 of the ports that provide access to the data storage by providing a report of the logical
8 unit numbers of storage that are accessible to said each host from said each of the ports
9 that provide access to the data storage.

10

11 45. The method as claimed in claim 40, which includes the apparatus providing
12 different storage access characteristics for the ports that provide access to the data
13 storage.

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15 46. The method as claimed in claim 40, which includes programming the apparatus
16 with a respective private/shared flag for each of the ports that provide access to the data
17 storage, the respective private/shared flag indicating whether or not said each of the
18 ports that provides access to the data storage provides data storage that is private to a
19 respective one of the hosts.

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21 47. The method as claimed in claim 40, which includes operating a graphical user
22 interface for programming the mapping of the hosts to the respective logical storage
23 units, the graphical user interface indicating which of the ports that provide access to
24 the data storage are accessible to each host.